Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

Claim 1. (Currently amended) A microfluidic device comprising a device and a gas-impermeable layer, the device comprising:

a sample-containment region plate;

at least one sample-containment region formed in the sample-containment region plate and capable of containing a sample;

a lid plate disposed on the sample-containment region plate, the lid plate comprising a top surface, and an outlet opening, the outlet opening being in fluid communication with the at least one sample-containment region and extending through the lid plate to the top surface; and

at least one non-porous, gas-permeable sample sealing plug disposed in and plugging the outlet opening and comprising a non-porous, gas-permeable polysiloxane material; and wherein

the gas-impermeable layer covers the device.

Claims 2-3. (Canceled)

Claim 4. (Previously Presented) The microfluidic device of claim 1, wherein the non-porous, gas-permeable polysiloxane material comprises at least one material selected from polydimethylsiloxane materials, polydiethylsiloxane materials, polydiphenylsiloxane materials, polymethylethylsiloxane materials, polymethylphenylsiloxane materials, and combinations thereof.

Claim 5. (Previously Presented) The microfluidic device of claim 1, wherein the non-porous, gas-permeable polysiloxane material comprises a polydialkylsiloxane material.

Claim 6. (Previously Presented) The microfluidic device of claim 1, wherein the non-porous, gas-permeable polysiloxane material comprises a polydimethylsiloxane material.

Claim 7. (Previously Presented) The microfluidic device of claim 1, wherein the non-porous, gas-permeable polysiloxane material comprises the reaction product of an uncrosslinked reactive polysiloxane monomer and from about 0.01 percent by weight to about 50 percent by weight of a polysiloxane crosslinker.

Claim 8. (Previously Presented) The microfluidic device of claim 1, wherein:

a channel is provided between the outlet opening and the sample-containment region; and

the channel includes a valve.

Claim 9. (Original) The microfluidic device of claim 8, wherein the valve is in a closed state and the fluid communication through the channel is interrupted.

Claim 10. (Original) The microfluidic device of claim 1, wherein the at least one sample-containment region comprises a plurality of sample-containment regions and the at least one non-porous, gas-permeable sample sealing plug comprises a plurality of non-porous, gas-permeable sample sealing plugs.

Claims 11-14. (Canceled)

Claim 15. (Original) The microfluidic device of claim 1, wherein the at least one sample-containment region contains a sample disposed therein.

Claim 16. (Original) The microfluidic device of claim 1, wherein the sample-containment region contains a dried sample.

Claim 17. (Original) The microfluidic device of claim 1, wherein the sample-containment region further comprises at least one of a nucleic acid sequence probe or nucleic acid sequence primer disposed therein.

Claim 18. (Original) The microfluidic device of claim 17, wherein the at least one nucleic acid sequence probe or nucleic acid sequence primer is in a dried form.

Claim 19. (Original) The microfluidic device of claim 1, wherein the at least one sample-containment region comprises a plurality of sample-containment regions arranged in an array.

Claim 20. (Original) The microfluidic device of claim 19, wherein a selected plurality of the sample-containment regions contain one of a nucleic acid sequence probe, a nucleic acid sequence primer, or a sample containing an analyte of interest.

Claim 21. (Original) The microfluidic device of claim 19, wherein a selected plurality of the sample-containment regions containing a sample, a nucleic acid sequence probe, or a nucleic acid sequence primer are arranged in one or more of a selected row or a selected column of the array.

Claims 22-60. (Canceled)

Claim 61. (Withdrawn) A method for venting a gas from a microfluidic device comprising:

providing a microfluidic device, the microfluidic device comprising;

at least one sample-containment region capable of containing a sample;

at least one non-porous, gas-permeable sample sealing plug at least partially defining the at least one sample-containment region, and comprising a non-porous, gas-permeable material;

an input opening in fluid communication with the sample-containment region;

loading a liquid into the microfluidic device; and

venting a gas from the microfluidic device through the at least one non-porous, gas-permeable sample sealing plug.

Claim 62. (Withdrawn) The method of claim 61, wherein the non-porous, gas-permeable material comprises a material having a permeability coefficient at about 35° C relative to O_2 of at least about 8×10^{15}.

Claim 63. (Withdrawn) The method of claim 61, wherein the non-porous, gas-permeable material comprises a polysiloxane material.

Claim 64. (Withdrawn) The method of claim 61, wherein the non-porous, gas-permeable material comprises at least one member selected from polydimethylsiloxane materials, polydiethylsiloxane materials, polydiphenylsiloxane materials, polymethylethylsiloxane materials, polymethylphenylsiloxane materials, and combinations thereof.

Claim 65. (Withdrawn) The method of claim 61, wherein the non-porous, gas-permeable material comprises a polydialkylsiloxane material.

Claim 66. (Withdrawn) The method of claim 61, wherein the non-porous, gas-permeable material comprises a polydimethylsiloxane material.

Claim 67. (Withdrawn) The method of claim 61 further comprising applying a gas-impermeable membrane to the at least one non-porous, gas-permeable sample sealing plug.

Claim 68. (Withdrawn) The method of claim 61, wherein the microfluidic device includes a channel in fluid communication with the sample-containment region, and the method further includes interrupting fluid communication through the channel.

Claim 69. (Withdrawn) A method for venting a gas from a microfluidic device comprising:

providing a microfluidic device, the microfluidic device comprising;

at least one sample-containment region capable of containing a sample;

at least one non-porous, gas-permeable sample sealing cover layer at least partially defining the at least one sample-containment region, and comprising a non-porous, gas-permeable material;

an input opening in fluid communication with the sample-containment region;

loading a liquid into the microfluidic device; and

venting a gas from the microfluidic device through the at least one non-porous, gas-permeable sample sealing cover layer.

Claim 70. (Withdrawn) The method of claim 69, wherein the non-porous, gas-permeable material comprises a material having a permeability coefficient at about 35° C relative to O_2 of at least about 8×10^{15}.

Claim 71. (Withdrawn) The method of claim 69, wherein the non-porous, gas-permeable material comprises polysiloxane material.

Claim 72. (Withdrawn) The method of claim 69, wherein the non-porous, gas-permeable material comprises at least one member selected from polydimethylsiloxane materials, polydiethylsiloxane materials, polydiphenylsiloxane materials, polymethylethylsiloxane materials, polymethylphenylsiloxane materials, and combinations thereof.

Claim 73. (Withdrawn) The method of claim 69, wherein the non-porous, gas-permeable material comprises a polydialkylsiloxane material.

Claim 74. (Withdrawn) The method of claim 69, wherein the non-porous, gas-permeable material comprises a polydimethylsiloxane material.

Claim 75. (Withdrawn) The method of claim 69, further comprising applying a gas-impermeable membrane to the at least one non-porous, gas-permeable sample sealing cover layer.

Claim 76. (Withdrawn) The method of claim 69, wherein the microfluidic device includes a channel in fluid communication with the sample-containment region, and the method further includes interrupting fluid communication through the channel.

Claim 77. (Withdrawn) A method comprising:

providing a microfluidic device including a plurality of sample-containment regions;

loading the plurality of sample-containment regions with a sample to form loaded sample-containment regions; and

sealing the loaded sample-containment regions with a non-porous, gas-permeable material cover layer.

Claim 78. (Withdrawn) The method of claim 77, further comprising:

loading a nucleic acid sequence probe or a nucleic acid sequence primer into selected sample-containment regions.

Claim 79. (Withdrawn) The method of claim 78, wherein the nucleic acid sequence probe or the nucleic acid sequence primer is loaded into the loaded sample-containment regions.

Claim 80. (Withdrawn) The method of claim 78, wherein the nucleic acid sequence probe or the nucleic acid sequence primer is loaded prior to loading the plurality of sample-containment regions with the sample.

Claim 81. (Previously Presented) The microfluidic device of claim 1, wherein the sample containment region plate is a multiple through-hole plate.

Claim 82. (Previously Presented) The microfluidic device of claim 1, further comprising a substrate support disposed upon a bottom surface of the sample containment region plate.

Claim 83. (Previously Presented) The microfluidic device of claim 82 wherein the at least one sample-containment region comprises a plurality of sample-containment regions, and the substrate support comprises a plurality of pads respectively disposed in, and sealing, the plurality of sample-containment regions.

Claim 84. (Previously Presented) The microfluidic device of claim 82, wherein the substrate support comprises a polysiloxane material.

Claim 85. (Previously Presented) The microfluidic device of claim 82, wherein the substrate support and the sample-containment region plate are hinged together.

Claim 86. (Previously Presented) A microfluidic device comprising a device and a gas-impermeable layer, the device comprising:

a through-hole plate comprising a top surface, a bottom surface, and a plurality of through-holes;

a lid plate disposed on the top surface of the through-hole plate, the lid plate comprising a top ~~surface,~~ surface and an input channel, the input channel providing a fluid communication between the plurality of through-holes and the top surface of the lid plate;

at least one non-porous, gas-permeable sample sealing plug disposed in and plugging an end of the input channel, the plug comprising a non-porous, gas-permeable polysiloxane material; and

a substrate support ~~comprising~~ disposed upon the bottom surface of the through-hole plate; and wherein

the gas-impermeable layer covers the device.

Claim 87. (Previously Presented) The microfluidic device of claim 86, wherein the substrate support and the sample-containment region plate are hinged together.

Claim 88. (New) The microfluidic device of claim 1, wherein the gas-impermeable layer comprises an aluminum film layer.

Claim 89. (New) The microfluidic device of claim 1, wherein the gas-impermeable layer comprises a polyolefin film.

Claim 90. (New) The microfluidic device of claim 1, wherein the gas-impermeable layer comprises a polytetrafluoroethylene layer.